VT-DTMUA5-433

RF Transceiver Module

User's guide v5.0

V-chip Microsystems,Inc

Add：612-613, Enterprises Incubator No.1 Qilin Road Nanshan Shenzhen
Tel：86-755-88844812
Fax：86-755-22643680
E-mail：sales@digirf.com
ZIP：518052
Web：www.digiRF.com

Description

The VT_DTMUA5-433 module is designed as a wireless sub module for wireless communication between devices like controls, POS systems, data collectors etc. It offers several addressing modes and relieves the host systems of wireless-specific task such as checksum calculation, address resolution.

It can be deployed whenever the wireless exchange of data packet between two or more parties is required.

A USB interface (Virtual COM Port Device) whose data rate is adjusted flexibly is available for communicating with the host systems. The data rate can be adjusted from 2.4kbps to 230.4kbps.

Thanks to its small size and the external SMA antenna connector, the module can easily be installed in existing systems without any external circuits.

Key Features

- GFSK modulation
- Communication distance up to 1200 meter
- Supports addressing transparent communication
- Auto add preamble, checksum, address information
- Supports setting mode to configure parameters Channel, Interface Band Rate, Radio Data Rate, Output Power, Source Address, Destination Address
- USB interface (Virtual COM Port Device)
- Half Duplex communication, 8N1 format
- 5.0V DC Power Supply, Input voltage from a USB device
- Consumption: Transmit <250mA; Receive <55mA
- Optional Antenna

Application

- Automatic Meter Reading
- Wireless Sensor Network
- Data Collector
- Controls, Remote Controls
- POS Systems
- Building Automation
- Android Controls

Copyright @ 2013 V-chip Microsystems,Inc

Specification

Testing condition：Ta=25°C, VCC=5.0V

Parameter	**Value**	**Condition/Note**
Center Frequency	433MHz	Programmable
Modulation	GFSK	Customize for ASK/FSK/OOK/MSK
Output Power	Max: 27dBm	Programmable
Sensitivity	-110dBm	1.2kbps
Radio Data Rate	Max 500kbps	Programmable
USB Interface Rate	Max 230.4kbps	Programmable
Protocol Format	8N1	Programmable
Transmit Current	<250mA	Depend on output power
Receive Current	<55mA	
Distance	1200 meter	Open area; 27dBm; 2.4kbps
Operate Humidity	10%～90%	
Operate Temperature	-40℃～85℃	
Input Voltage	5.0VDC±10%	±100mV
Antenna	50ohm	
Size		

Note:

1. Noted that higher radio data rate causes of shorter communication disdance.
2. Noted that higher radio data rate causes of lower sensitivity.
3. Noted that lower input voltage causes of lower output power.
4. Noted that the operate temperature out of range -40℃～85℃ will influence the center frequency.
5. Be sure to use a match antenna and mount it in the right way.
6. The environment will influence the communication disdance much.

Copyright @ 2013 V-chip Microsystems,Inc

Driver

The USB interface is a virtual COM Port Device base on USB to UART bridge solution. Install the drivers before connecting the module to a computer.

The virtual COM Port Device can be found as the Fig 1 shows.

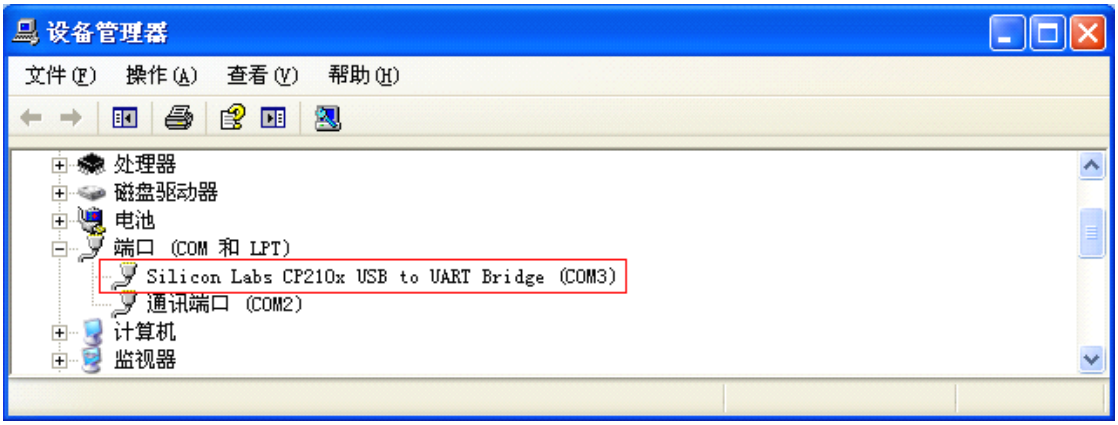

Fig 1 Virtual COM Port Device

Input Voltage

The input voltage of the module ranges from 4.5V to 5.5V. A clean supply voltage is needed for the module to function correctly.

LEDs

There are 3 LEDs install in the module：

RED_LED: Power-on indicates.

BLUE_LED: Receive data indicate.

GREEN_LED: Transmit data indicate.

Operating Modes

The device can be used in the following operating modes:

1. Transceiver, Buffered data transceiver
2. Setting Mode

The device is default on transparent mode and can select by commands. See “Setting Mode” part in detail.

Transceiver Mode

Transparent mode:

In this operating mode, data of the transmitter module is received via the USB interface and initially buffered. As soon as specific conditions are met (timeout or data buffer be filled full), the radio telegram is generated with preamble, Sync word, and Checksum and address information (modules address are the same). As soon as the transmission of a packet has begun, the USB interface cannot receive any further data.

The receiver module receives the wireless telegram and transmits the payload characters via USB interface. As long as receiver module is busy in sending characters via the USB interface, wireless telegram reception is not possible. For example, this effect is noticeable when sending a long data packet and subsequently a short data

Copyright @ 2013 V-chip Microsystems,Inc

packet. In this case, the receiver module may still be busy in sending the first packet via USB interface and the second packet may be lost.

For example, if the transmitter send “1234567890”, all module in the receive range can receive “1234567890”. This operating mode supports range extender device that can receive the data and re-transmits data to other receiver.

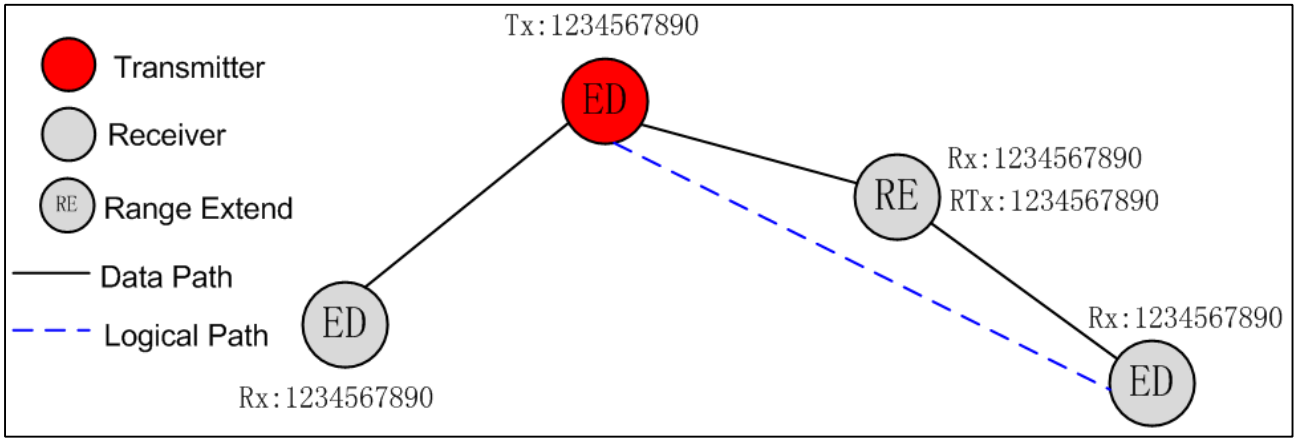

Fig 2 Transparent Mode

Addressing mode:

In this operating mode, the transmitter’s source address and destination address need to be the same as the receiver’s destination address and source address respectively. For example, set the transmitter’s source address 0x0001 and destination address 0x0004, and set the receiver’s source address 0x0004 and destination address 0x0001. The transmitter send “1234567890” then the receiver can receive “1234567890”. This operating mode is useful in Point-to-Point communication and supports the range extender device that re-transmits data to the destination module.

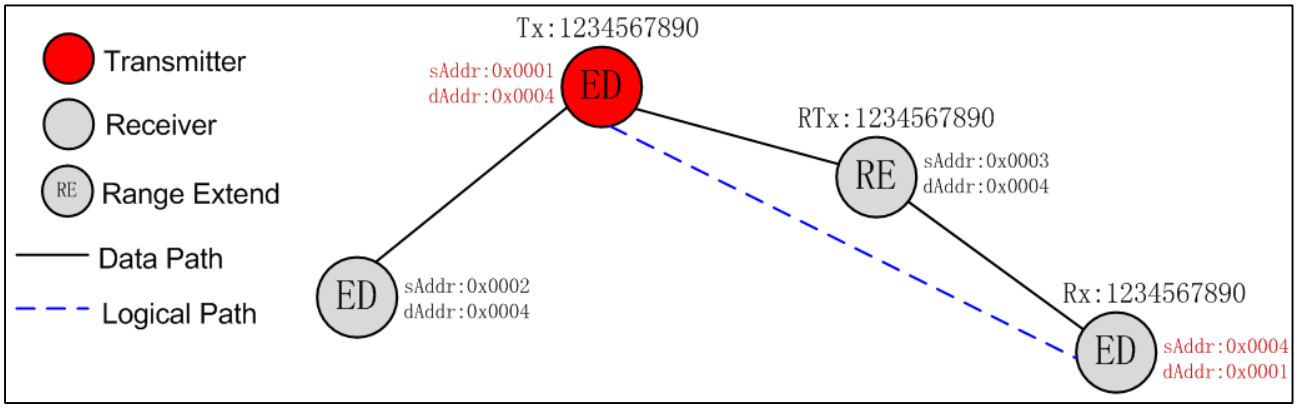

Fig 3 Addressing Mode

Master-Slave mode:

In this operating mode, the first 2 bytes of data from the USB is the destination address in the Master side, the data send to the correct destination address, and the first 2 bytes of data from wireless is the source address, it tell to the master where the data from. For example, set the master’s source address 0x0001, if we want to send the data “ABC” to the destination module (source address 0x0002), send data “0x0002+ABC” to the master, then the destination can receive the data “ABC”. If the master receives data from a slave “0x0004+123”, the 0x0004 is the slave’s address.

Copyright @ 2013 V-chip Microsystems,Inc

The destination address and source address do not input or output via the USB in the Slave side, but the slave's destination address must set as the same as the master's source address.

This operating mode is a typically start topology mode and supports range extender device that re-transmits data to the destination module.

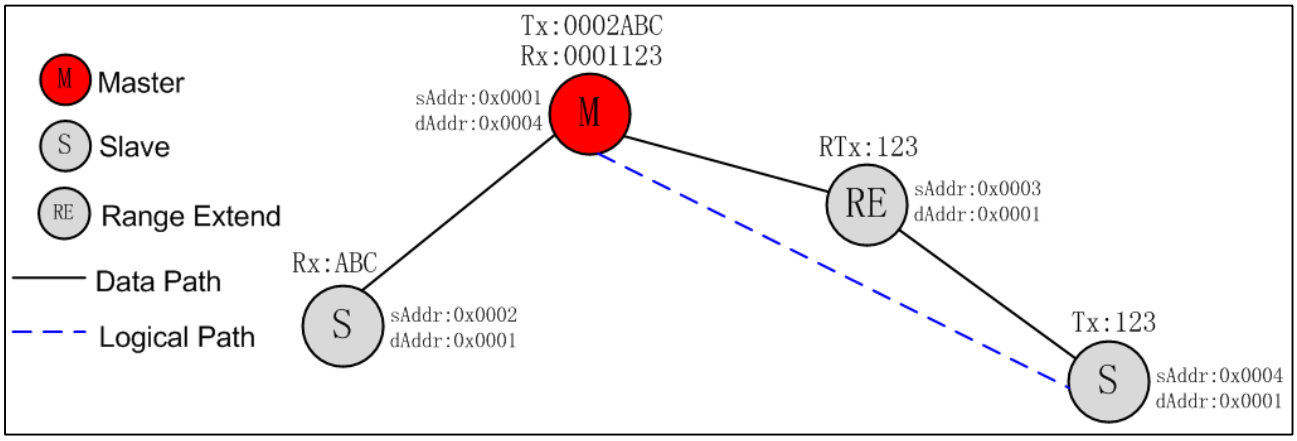

Fig 4 Master-Slave Mode

Range Extend mode:

To extend communication range, range extender can be use in transparent mode, addressing mode and Master-slave mode. The range extender re-transmits the data to the destination module, and can receive data if destination address correct.

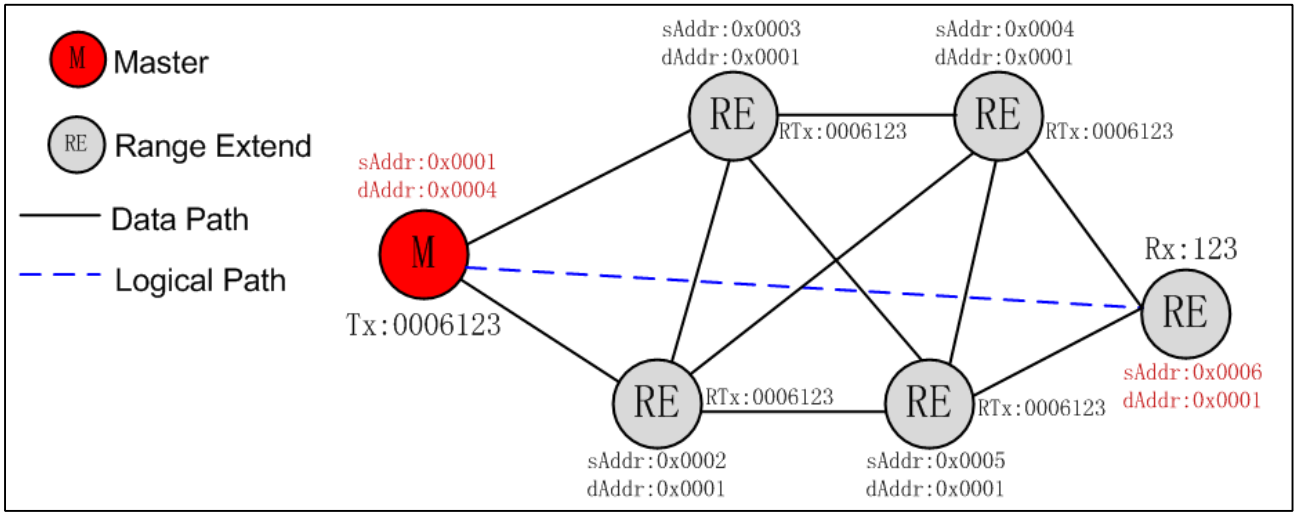

Fig 5 Master-Slave Mode

Setting Mode

When receiving the Enter Setting Mode command, device enter setting mode. In setting mode, user can set the parameters. The device stays on setting mode until receive the Exit Setting Mode command.

Some parameters are sending out when power on to help user remember what parameters have set. User can collect the parameters information correctly if configure the parameter of USB to 9600bps, 8N1, as Fig 6.

"VT-DTMUA5-433": Part Number

"V01.20 F05.00": Version

"SN:0000000000000000": Serial Number

"UART Baud:03": UART baud setting value

"UART Option:02": UART option setting value

"Radio Baud:03": Radio band setting value

"Radio Channel:03": Radio Channel setting value

Fig 6 Parameter Collect

Setting Command

All Commands are used HEX format, and the command format is:

Data	SOF	CMD	PLOAD	EOF
Length(byte)	1	1	n	1
Functions	Start Byte	Command Byte	Data Byte	Stop Byte

SOF: Start byte, 0xFD;

CMD: Command byte, indicate different command;

PLOAD: Data bytes, configure content;

EOF: Stop byte, 0xFE。

CMD 1: Enter Setting Mode

If enter setting mode and then set the parameters, the setting parameters will be stored.

Data	SOF	CMD	EN1	EN2	EN3	EN4	EN5	EOF
Length(byte)	1	1	1	1	1	1	1	1
Functions	0xFD	0x00	0x55	0x55	0x55	0x55	0x55	0xFE

Respond:

Data	SOF	CMD	STATE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0x00	0 Success; non-0 Fail	0xFE

CMD 2: Exit Setting Mode

Data	SOF	CMD	EN1	EN2	EN3	EN4	EN5	EOF
Length(byte)	1	1	1	1	1	1	1	1
Functions	0xFD	0xFF	0xAA	0xAA	0xAA	0xAA	0xAA	0xFE

Respond:

Data	SOF	CMD	STATE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0xFF	0 Success; non-0 Fail	0xFE

CMD3:

Data	SOF	CMD	UBAUD	UOPTION	DBAUD	CHANNEL	POWER	EOF
Length(byte)	1	1	1	1	1	1	1	1
Functions	0xFD	0x01	COM Baud	COM Option	RF Baud	Channel	Output Power	0xFE

UBAUD: COM baud

UBAUD	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0a	0x0b
Baud	1.2k	2.4k	4.8k	9.6k	14.4k	19.2k	28.8k	38.4k	57.6k	76.8k	115.2k	230.4k

UOPTION: COM Option

UOPTION BIT	Items	Value 1	Value 0
BIT.7	ORDER	MSB	LSB
BIT.6	FLOW	Flow control enable	Flow control disable
BIT.5	D9	ODD-Parity	EVEN-Parity
BIT.4	BIT9	9Bits	8Bits
BIT.3	PARITY	Enable	Disable
BIT.2	SPB	2bits	1bit
BIT.1	STOP	High level	Low level
BIT.0	START	High level	Low level
Note：If parity enable，BIT9 set to 9Bits。			

DBAUD：RF Baud：

UBAUD	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09
Baud	1.2k	2.4k	4.8k	9.6k	19.2k	38.4k	76.8k	100k	250k	500k

CHANNEL：Channel：

CHANNAL	0x00～0x32
Frequency Range	428MHz～438MHz
Note： Supports 51 channels, channel spacing 200kHz, the channel 0 frequency is 428MHz, and the channel 50 frequency is 438MHz.	

POWER：RF output power：

POWER(Hex)	C0	63	68	6C	28	26	25	1F	32	19	0E	0B	08	07	05	04	03
Po(dBm)	27	23	20	17	15	13	11	9	7	5	3	1	-1	-3	-5	-7	-9

Respond：

Copyright @ 2013 V-chip Microsystems,Inc

Data	SOF	CMD	STATE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0x01	0 Success; non-0 Fail	0xFE

CMD4：Address setting

Data	SOF	CMD	TYPE	SADD	DADD	EOF
Length(byte)	1	1	1	2	2	1
Functions	0xFD	0x02	Setting Type	Source address	Destination address	0xFE

TYPE：Setting Type，

0x00－Set the source address and the destination address；

0x01－Set the source address；

0x02－Set the destination address。

SADD：Source Address :0x0001～0xFFFE; Reserved 0x0000 and 0xFFFF；

DADD：Destination Address 0x0001～0xFFFE; Reserved 0x0000; Broadcast address 0xFFFF。

Respond：

Data	SOF	CMD	STATE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0x02	0 Success; non-0 Fail	0xFE

CMD5：Communication mode and sleep mode

Data	SOF	CMD	COMOPTION	SLPTYPE	T_{WOR_SIEEP}	T_{WOR_RX}	T_{RX}	EOF
Length(byte)	1	1	1	1	1	1	1	1
Functions	0xFD	0x03	Communication mode	Sleep mode	BIT7：0 (s)，1 (ms) BIT6-BIT0：Time tick			0xFE

COMOPTION：Communication mode

COMOPTION	0x00	0x01	0x02	0x03	0x04	0x05	0x06
Mode	Transparent	Transparent range extender	Addressing	Addressing range extender	Master	Slave	Master-Slave range extender

SLPTYPE：Sleep Mode（only supports for UART module）

SLPTYPE	0x00	0x01	0x02	0x03
Mode	Not sleep	Sleep-wake up by UART	Sleep-wake up by I/O	Sleep-wake up by RF

T_{WOR_SIEEP}：WOR sleep time（only supports for UART module）

T_{WOR_SIEEP}	BIT.7	BIT.6-BIT.0
Time	s/ms	Time

T_{WOR_RX}：WOR Rx timeout（only supports for UART module）

T_{WOR_RX}	BIT.7	BIT.6-BIT.0
Rx Timeout	s/ms	Time

T_{RX}：Rx time（only supports for UART module）

T_{RX}	BIT.7	BIT.6-BIT.0

Copyright @ 2013 V-chip Microsystems,Inc

Rx Time	s/ms	Time

Respond:

Data	SOF	CMD	STATE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0x03	0 Success; non-0 Fail	0xFE

命令六：读设置

Data	SOF	CMD	TYPE	EOF
Length(byte)	1	1	1	1
Functions	0xFD	0x04	0x00 Read all parameters 0x01 Read UART Baud rate 0x02 Read UART Option 0x03 Read RF Baud rate 0x04 Read Channel 0x05 Read output power 0x06 Read source address 0x07 Read destination address 0x08 Read communication mode 0x09 Read sleep mode 0x0a Read Rx timeout 0x0b Read WOR sleep time 0x0c Read WOR Rx timeout	0xFE

Respond:

Data	Lengfh(bytes)	Functions
SOF	1	0xFD
CMD	1	0x04
UBAUD	1	UART Baud rate
UOPTION	1	UART Option
DBAUD	1	RF Baud rate
CHANNEL	1	Channel
POWER	1	Output power
SADD	1	Source address
DADD	1	Destination address
COMOPTION	1	Communication Mode
SLPTYPE	1	Sleep Mode
T_{WOR_SlEEP}	1	WOR sleep time
T_{WOR_RX}	1	WOR Rx timeout
T_{RX}	1	Rx timeout
EOF	1	0xFE

Note:

Default Parameters:

Item	**Parameter**	**Describe**

Copyright @ 2013 V-chip Microsystems,Inc

UBAUD	0x03	9600bps
UOPTION	0x02	8N1
DBAUD	0x03	9600bps
CHANNEL	0x00	428MHz
POWER	0xC0	27dBm
SADD	0x0001	
DADD	0x0001	
COMOPTION	0x00	Transparent
SLPTYPE	0x00	Not sleep
T_{WOR_SLEEP}	0x00	/
T_{WOR_RX}	0x00	/
T_{RX}	0x00	/

Antennas

We offer many kinds of antennas. We can design a matching antenna for specific conditions. Some of the antennas are show on the Tab 2.

Tab 1 Antennas

Spring Antenna ➢ Small size ➢ Low cost ➢ Easy to embedded	
SMA Plastic Antenna ➢ Medium size ➢ Low cost ➢ High gain	

Copyright @ 2013 V-chip Microsystems,Inc

Sucker Antenna ➢ High gain ➢ Have sucker ➢ Easy to fix	

Troubles and Processing Methods

Troubles	Processing Methods
Short distance	1. Check the input voltage; ensure it is not lower than 4.5VDC. 2. Configure the output power parameter to the max. 3. Check the antenna; ensure it is not to be shielded. 4. Configure the radio data rate to a lower value.
Communicating failed	1. Check the input voltage. 2. Reconnect the module to the host. 3. Addresses of the communicating modules are all right. 4. LEDs flash while transmission or reception.
High error rate	1. Antenna does not match to the module. 2. Co-Channel interference, try another channel.

IMPORTANT NOTICE

V-chip Microsystems,Inc. (short of V-chip)reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to V-chip's terms and conditions of sale supplied at the time of order acknowledgment.

V-chip warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with V-chip's standard warranty. Testing and other quality control techniques are used to the extent V-chip deems necessary to support this warranty.

V-chip does not warrant or represent that any license, either express or implied, is granted under any V-chip patent right, copyright, mask work right, or other V-chip intellectual property right relating to any combination, machine, or process in which V-chip products or services are used. Information published by V-chip regarding third-party products or services does not constitute a license from V-chip to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from V-chip under the patents or other intellectual property of V-chip.

Copyright @ 2013 V-chip Microsystems,Inc

Reproduction of V-chip information in V-chip data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. V-chip is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of V-chip products or services with statements different from or beyond the parameters stated by V-chip for that product or service voids all express and any implied warranties for the associated V-chip product or service and is an unfair and deceptive business practice. V-chip is not responsible or liable for any such statements.